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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/936,436	09/13/2001	Tatsumi Watanabe	50023-150	3632

20277 7590 03/21/2006

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EXAMINER	
DANG, DUY M	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 03/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/936,436	WATANABE ET AL.	
	Examiner	Art Unit	
	Duy M. Dang	2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23,32,40 and 63-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23,32,40, and 63-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 September 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's amendment filed on January 05, 2006 has been entered and made of record.

2. Claims 23,32,40, and 63-67 are currently pending.

Response to Arguments

3. Applicant's arguments, see page 6 of applicant's response filed on January 05, 2006 with regard to the rejection of claims 40 and 67 under section 35 U.S.C. 101 have been fully considered and are persuasive. The amendment filed on January 05, 2006 amends claims 40 and 67 to include "computer readable medium". Therefore, such rejection has been withdrawn.

4. Applicant's arguments, see pages 6-11 of applicant's response filed January 05, 2006 with regard to the rejection of claims 23, 32, 63-64, 66 and 67 under section 35 U.S.C. 103(a) as being unpatentable over Wober et al. (Wober) in view of Linares have been fully considered but they are not persuasive.

I. In page 7, 2nd paragraph, applicant's arguments states: (a)"*Wober et al. and Linares, either individually or in combination, do not teach, among other things, estimating frequency components of an enlarged image by performing interpolation on the frequency components of an original image (the frequency domain)*" and (b)"*performing inverse transformation of the frequency components of the enlarged image.*" The examiner respectively disagrees and the reasons as follows:

I-1. With regard to (a), it is noted that the "frequency domain" is noted recited in claims. The claimed "frequency components" does not necessarily invoke "frequency domain". Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181,

26 USPQ2d 1057 (Fed. Cir. 1993). Even if it is assumed that claimed "*frequency components*" refers to "*frequency domain*" and claimed interpolation perform interpolation on the frequency domain, Wober's interpolation does perform interpolation on the frequency domain as well. For example, the function of S(u) described in equation 1 of Wober represents the "DCT coefficients for the frequency domain" according to column 4 lines 28-48 which states:

> **A forward DCT is defined as a mathematical process for transforming image data points from the spatial domain to the frequency or, more particularly, DCT domain. Image data points s(i) in one dimensional form may be transformed from the spatial domain to DCT coefficients S(u) for the frequency domain according to equation (1).**
>
> $$S(u) = C_u \sqrt{\frac{2}{N}} \sum_{i=0}^{N-1} s(i) \cos \frac{(2i+1)u\pi}{2N} \qquad (1)$$
>
> **for $0 \leqq u \leqq (N-1)$, where:**
> **S(u) represents the DCT coefficients;**
> **s(i) represents the image data point;**
> **N represents the number of image data points;**
>
> $$C_u = \frac{1}{\sqrt{2}}$$
>
> **for u=0; and**
> **C_u=1 for u≠0.**

In addition, Wober teaches using DCT to enlarge an image by interpolation according to column 4 lines 21-22 which states:

> This invention relates generally to improved methods and apparatus for image processing. More particularly, the invention relates to novel methods and apparatus for using discrete cosine transformations to: enlarge an image by interpolation; reduce an image by decimation; and/or filter an image in the frequency domain by a method equivalent to a mathematical convolution in the spatial domain.

It is also noted that function of "S" (upper case), either one dimensional S(u) or two dimensional S(v,u), corresponds to DCT coefficients in the DCT domain or frequency domain according to equation (1) above for one dimensional and equation (3) for two dimensional as shown below (or column 5 lines 44-55):

> The above examples for a one dimensional DCT and IDCT can be extended, as known by those skilled in the art, to multi-dimensional formats. For instance, Section A.3.3 of ISO/IEC 10918-1 of the draft international standards for digital compression using discrete cosine transforms defines the forward DCT in two dimensional form as:

$$S(v,u) = \frac{1}{4} C_u C_v \sum_{i=0}^{7} \sum_{j=0}^{7} s(j,i) \cos \frac{(2i+1)u\pi}{16} \cos \frac{(2j+1)v\pi}{16} \quad (3)$$

and (column 6 lines 10-43):

According to equation (3), a first spatial matrix s(j,i) (representing a two dimensional 8×8 group of original image data points in the spatial domain) can be forward DCT transformed to an 8×8 DCT matrix S(v,u) in the frequency domain having 64 DCT coefficients that can be related to the 64 image data points through mapping. An 8×8 forward DCT basis matrix, i.e. forward transform matrix, is derived from the cosine expression of equation (3) by indexing over the full range of values for j, i, v and u.

Once the image data points s(j,i) are transformed into DCT coefficients S(v,u) in the DCT domain, the number of DCT coefficients can be reduced by compression which is defined, generally, as the process of reducing either the bandwidth or the number of bits necessary to represent an image and, more specifically, as the process of decreasing the number of DCT coefficients S(v,u) in the DCT domain by removing a selected set of the DCT coefficients. The selected set are determined to be non-essential to image reproduction according to some predetermined criteria. Typically, the set of DCT coefficients selected for removal includes zero or near zero values or those terms which represent high frequency content that the human visual system cannot perceive thus no necessary information is lost.

Another aspect of image processing in the DCT domain is sharpening anal smoothing an image by a filtering procedure mathematically equivalent to a convolution in the spatial domain. A convolution of two discrete signals in the spatial domain occurs by multiplying the two discrete signals point-by-point then summing the products over appropriate limits. Sharpening is defined as the process of enhancing blurry images, particularly by emphasizing high frequency components representing edges in an image. Smoothing, on the other hand, is defined as the process for either softening the edges of the image or alternatively decreasing high frequency components.

Thus, it appears to be that applicant has mischaracterized the patent to Wober and concludes that Wober's interpolation does not perform interpolation in the frequency domain.

I-2. With regard to (b) ("*performing inverse transformation of the frequency components of the enlarged image.*"), Wober does teach these features as well. For example, column 12 lines 25-29 teaches inverse transformation of frequency component of enlarged image S(u,v).

II. It is noted that most applicant's arguments focus on individual reference while the examiner replies on the combination of Wober and Linares to reject the claimed invention. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

III. In reply to applicant's arguments set forth in pages 9-10 of applicant's response with regard to Linares that "fails to teach estimate the frequency components by non-linear interpolation", it is noted that the claimed "non-linear interpolation" is never properly defined in rejected claims. Applicant is reminded that the examiner is entitled to give the broadest reasonable interpretation to the language of the claims. The examiner is not limited to applicant's definition which is not specifically set forth in the claims. In re Tanaka et al., 193 USPQ, (CCPA) 1977. In this case, Linares teaches using interpolation for vertical and horizontal frequency components (see col. 5 lines 45-56) and estimated frequency interpolation (see col. 7 lines 6-7). Thus, Linares teaches claimed invention.

IV. In reply to applicant's arguments set forth on page 11 of applicant's response with regard to claim 65, it is noted that applicant's arguments have relied on the arguments applied to claim 63. So, examiner's response set forth in I-III above are incorporated herein.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 23, 32, 40, 63-64, 66 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wober et al. [US Patent No. 5,740,284] in view of Linares [US Patent No. 6,760,487].

Regarding claims 23 and 32, Wober teaches:

original image orthogonal transforming means for generating the frequency components of an original image by performing orthogonal transform on said specific image data [i.e., the "forward discrete cosine transform (DCT)" mentioned in col. 4 lines 25-27] corresponds to claimed transforming means];

enlarged frequency estimating means for estimating the frequency components of said enlarged image by performing nonlinear interpolation on said original image frequency components [see interpolation for enlarging image mentioned in col. 4 lines 21-22], and

inverse orthogonal transform means for acquiring an enlarged image data by performing inverse orthogonal transform corresponding to said enlargement size on said estimated frequency components of the enlarged image [i.e., the inverse discrete cosine transforms (DCT) mentioned in col. 4 lines25-27].

While Wober teaches using interpolation to enlarge image, Wober does not explicitly teach nonlinear interpolation. However, using nonlinear interpolation is well known in the art as evidenced by Linares who suggest to use such nonlinear interpolation on frequency components of the original image according to figures 3b and 3d and mentioned in col. 5 lines 47-56 and col. 7 lines 6-7.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the nonlinear interpolation as taught by Linares in combination with Wober. Utilizing nonlinear interpolation on frequency component would provide advantages such as more accurate estimation, more pixel information represented image, smoother image, retaining much of the image quality.

Regarding claim 40, it is noted this claim recites a recorded medium on which a program is recorded for carrying out the claimed features called for in claims 23 and 32. Thus, the advanced statements as applied to claims 32 and 32 above are incorporated herein. Wober further teaches the use of computer for image processing [see col. 1 lines 39-41 and col. 2 lines 35-38].

Regarding claims 63, 65, and 66, these claims are also rejected for the same reasons as set forth in claims 23 and 32 above.

Regarding claims 67, this claim is also rejected for the same reasons as set forth in claim 40 above.

7. Claim 65 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wober et al. [US Patent No. 5,740,284] in view of Linares [US Patent No. 6,760,487] as applied to claims 23, 32, 40, 63-64, and 67 above, and further in view of Pawlicki et al. [US Patent No. 5,995,682].

Regarding claim 65, the combination of Wober and Linares fails to teach the use of neural network for interpolation. However, such feature is well known in the art as evidenced by Pawlicki et al. in figures 10-11 and figure 5, items 530 and 555.

Therefore, it would have been obvious to of the ordinary skill in the art at the time the invention was made to use the features as taught by Pawlicki in combination with the

combination of Wober and Linares because the advantage of the neural network that of more robust computation.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duy M. Dang whose telephone number is 571-272-7389. The examiner can normally be reached on Monday to Friday from 6:00AM to 2:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew C. Bella can be reached on 571-272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dmd
3/06

Duy M. Dang
Patent Examiner